US009851170B1

(12) **United States Patent**
Liu

(10) **Patent No.: US 9,851,170 B1**
(45) **Date of Patent: Dec. 26, 2017**

(54) **ARROW RETENTION DEVICE OF CROSSBOW**

(71) Applicant: **Chi-Chang Liu**, Taichung (TW)

(72) Inventor: **Chi-Chang Liu**, Taichung (TW)

(73) Assignee: **POE LANG ENTERPRISE CO., LTD.**, Chi-Chang Liu

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/586,290**

(22) Filed: **May 4, 2017**

(51) **Int. Cl.**
F41B 5/12 (2006.01)

(52) **U.S. Cl.**
CPC ***F41B 5/12*** (2013.01); *F41B 5/123* (2013.01)

(58) **Field of Classification Search**
CPC F41B 5/12; F41B 5/123
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,802,304	B1 *	10/2004	Chang	F41B 5/1469 124/25
7,588,022	B2 *	9/2009	Chang	F41B 5/123 124/25
7,770,567	B1 *	8/2010	Yehle	F41A 17/46 124/25
2009/0194086	A1 *	8/2009	Kempf	F41A 19/10 124/25
2015/0260477	A1 *	9/2015	Khoshnood	F41B 5/12 124/25

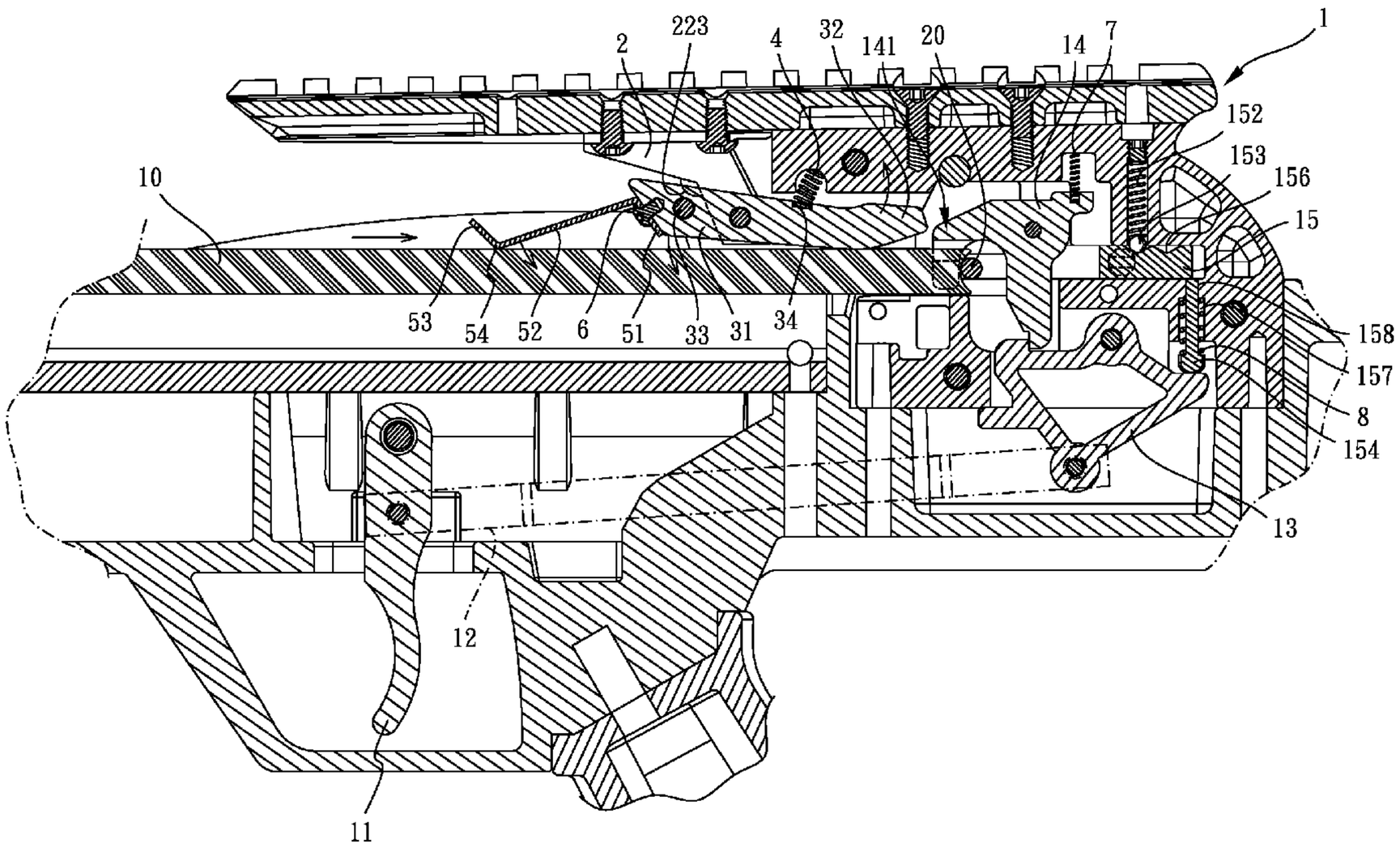
* cited by examiner

Primary Examiner — John Ricci

(57) **ABSTRACT**

An arrow retention device of a crossbow includes a fixing member which has one end thereof fixed to the shooting device, and an installation slot is defined axially in the underside of the fixing member. An arm is pivotably inserted into the installation slot and has a first end and a second end. The first end is exposed beyond the installation slot, and the second end of the arm is inserted into the shooting device. A restriction rod extends from each of two sides of the arm. A pushing spring connected to the top of the arm is biased between the second end of the arm and the shooting device. A retention member is connected to the arm and includes a contact portion for pressing an arrow. When shooting the arrow, the pushing spring pivots the arm back, and the contact portion is separated from the arrow.

7 Claims, 10 Drawing Sheets



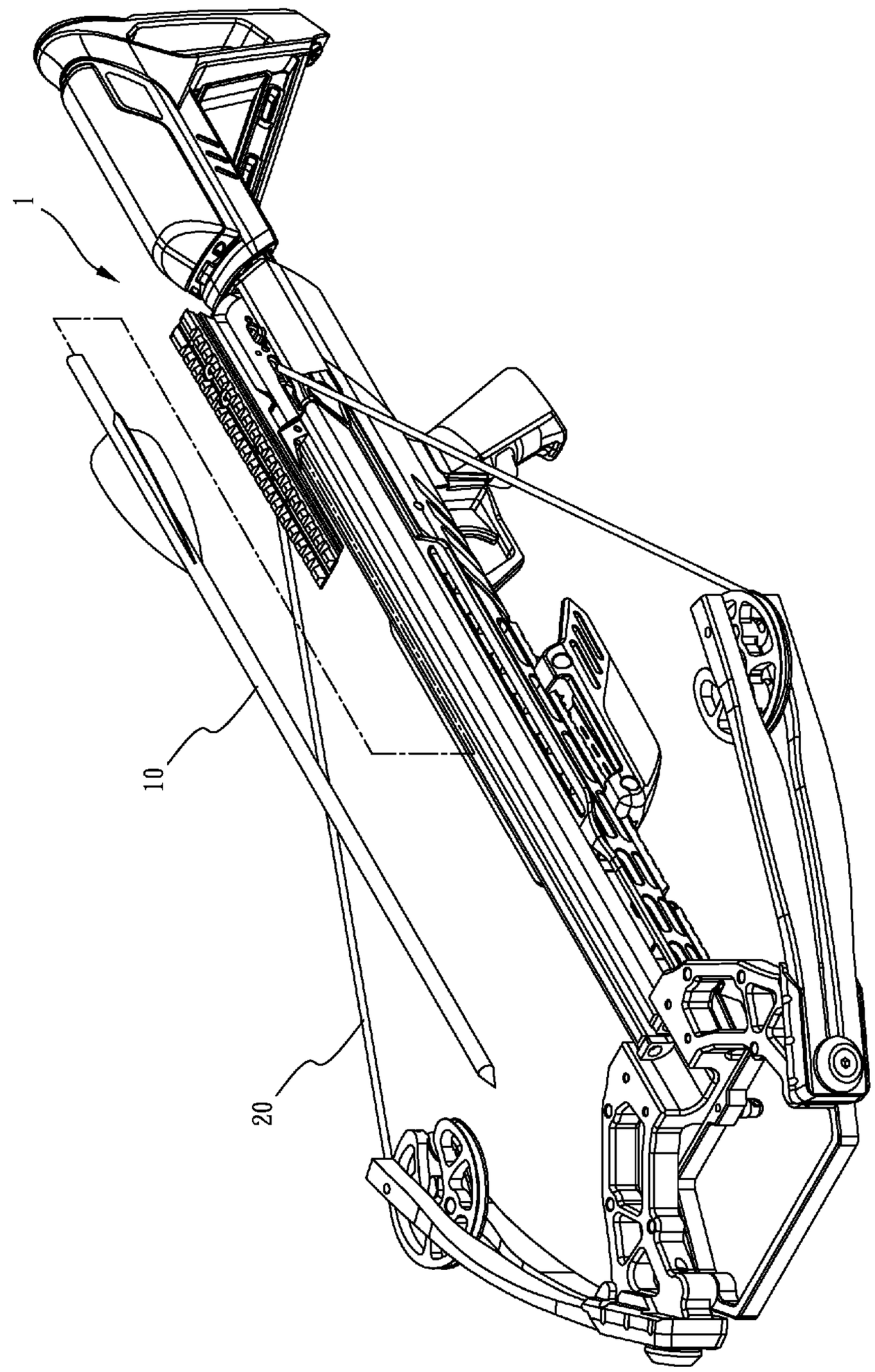


FIG.1

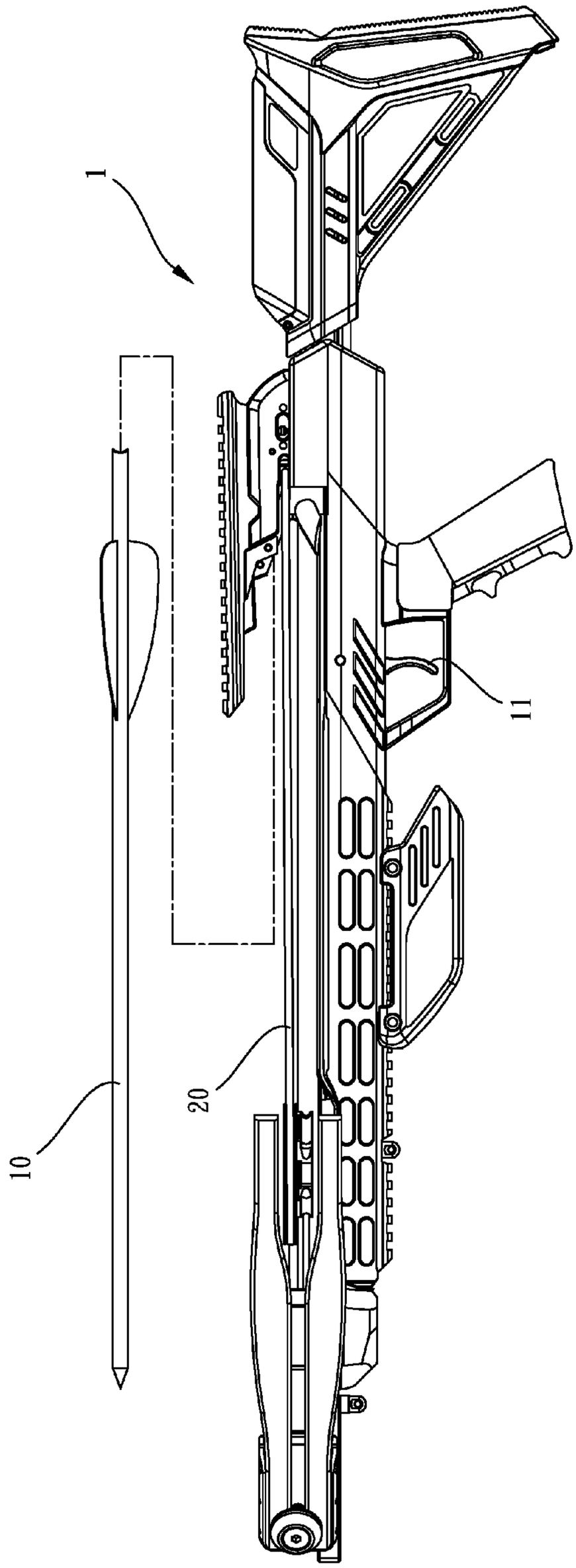


FIG.2

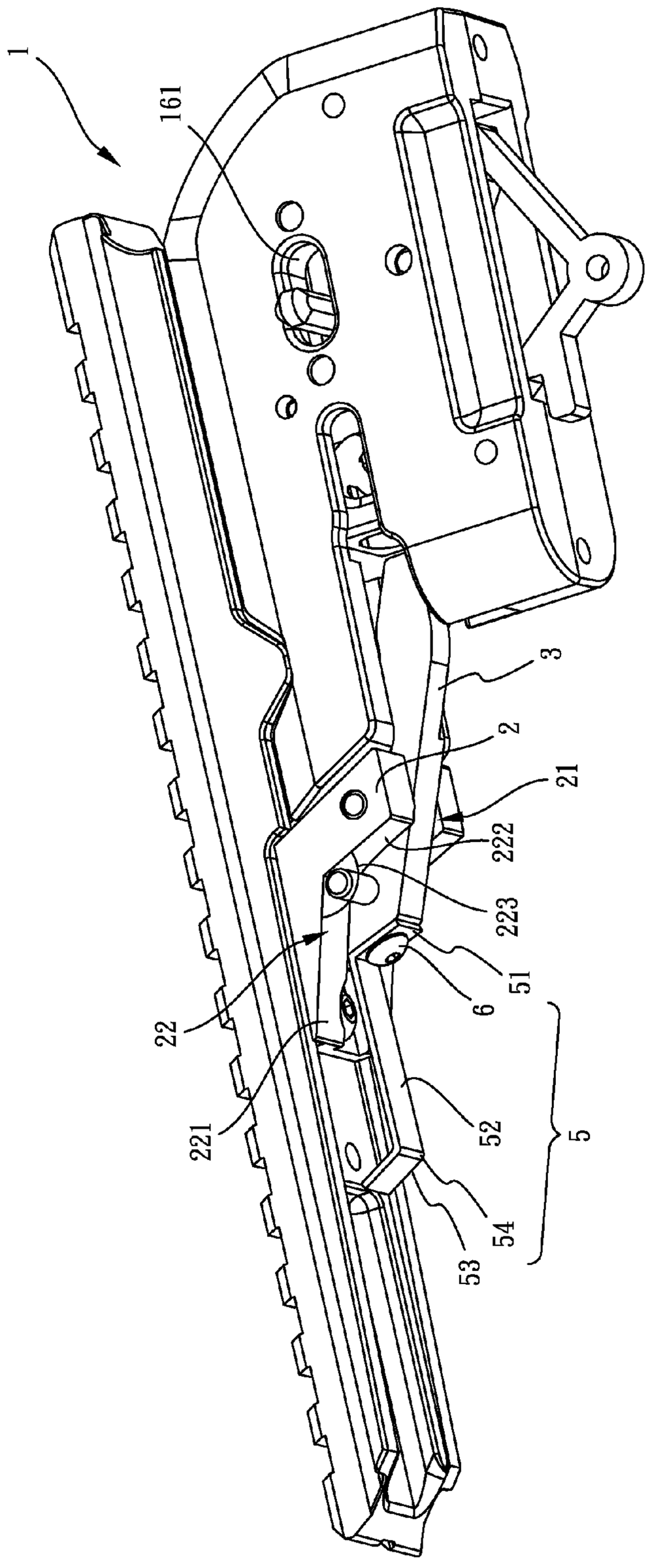


FIG.3

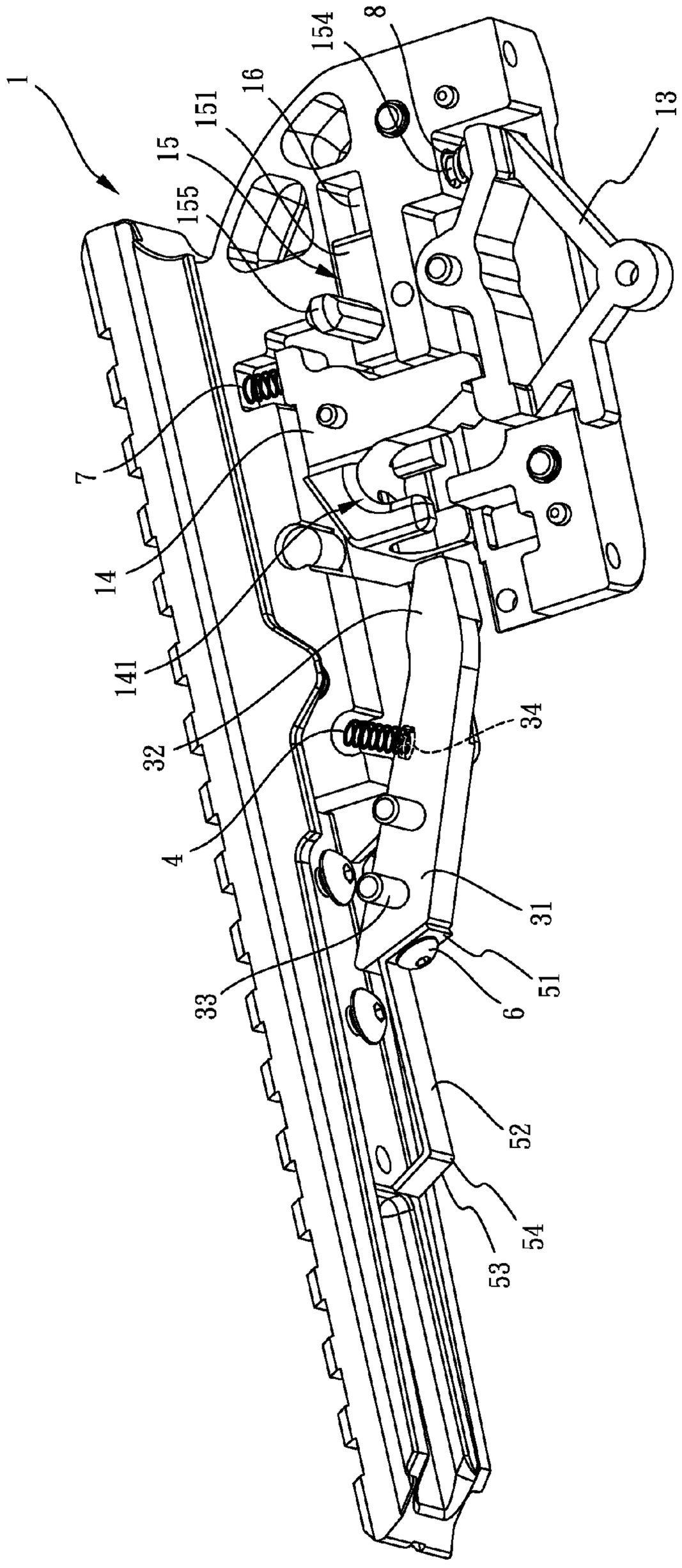


FIG.4

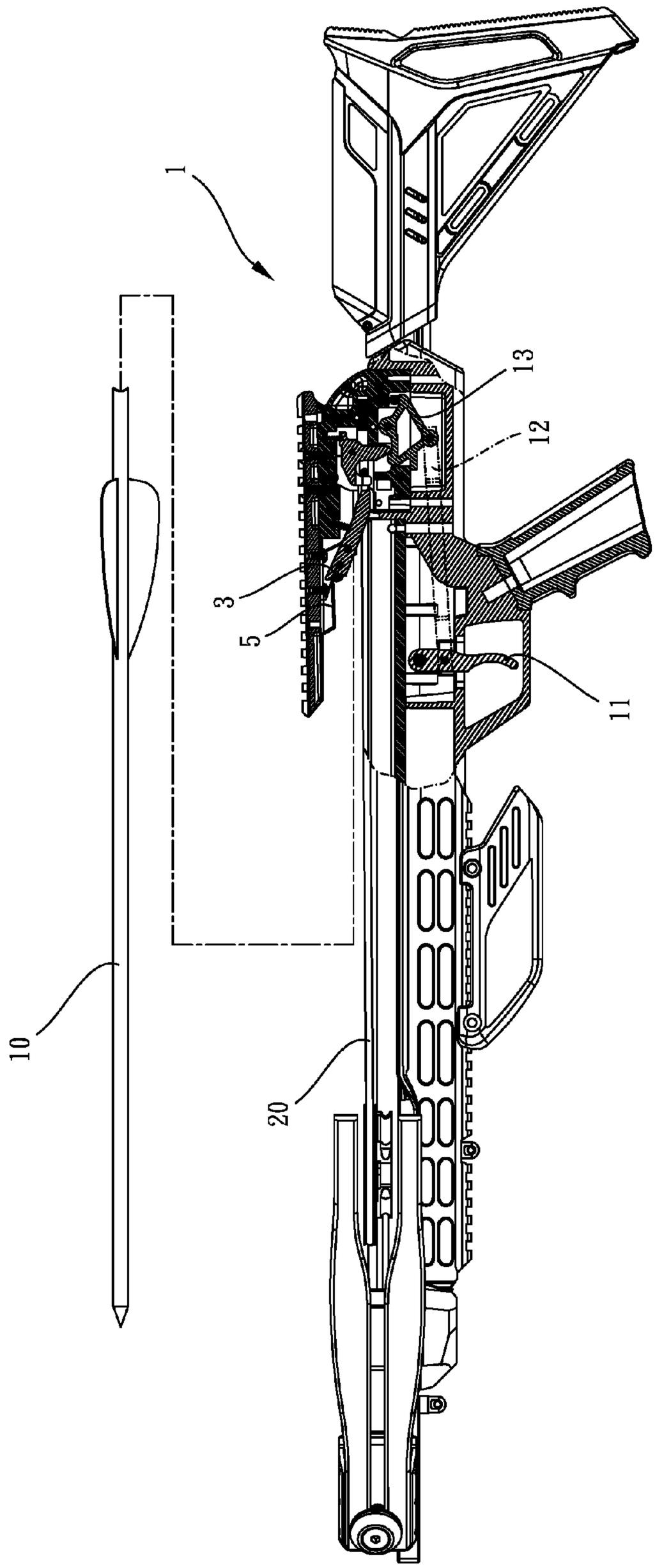


FIG.5

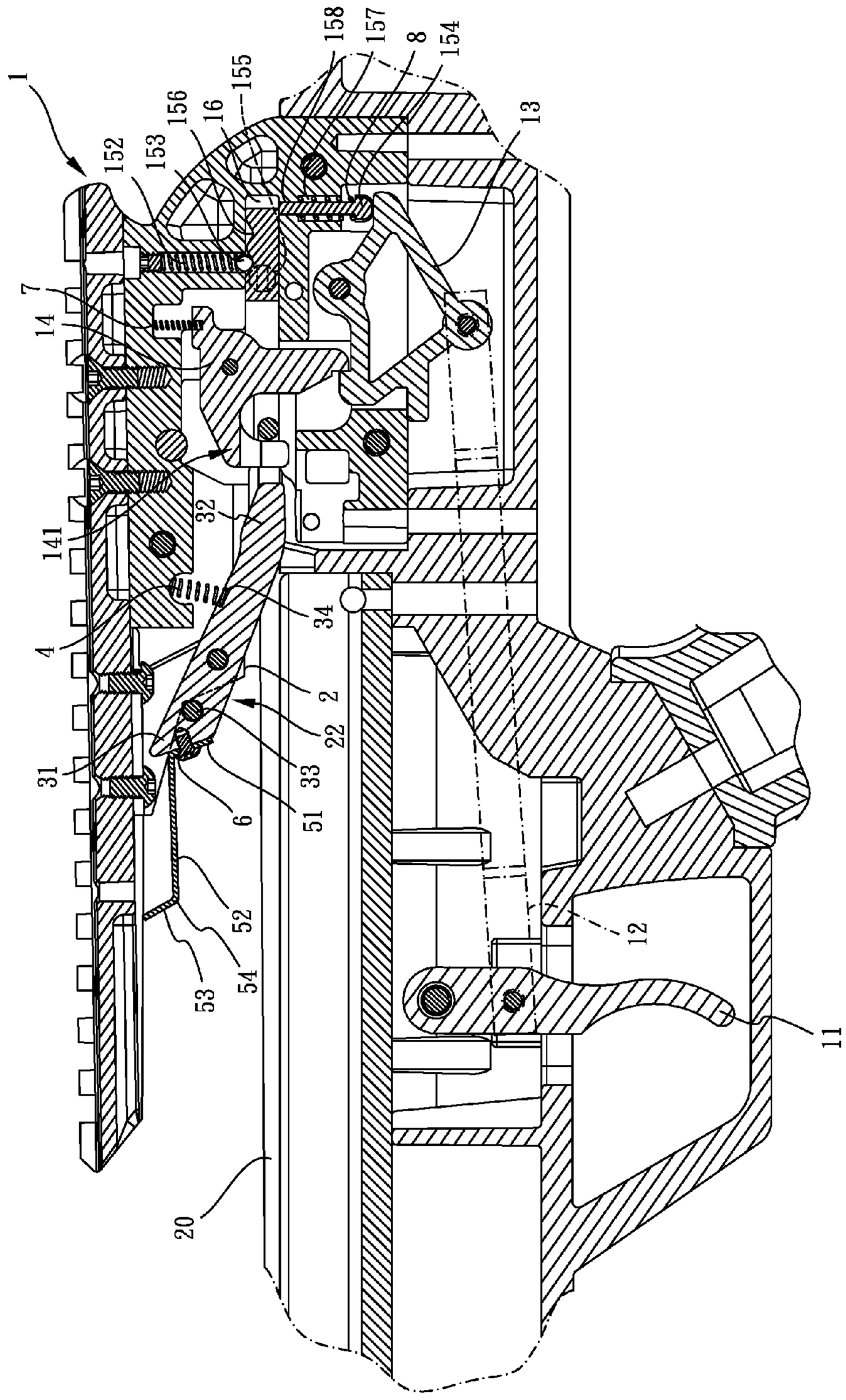

1
152
153
156
16
155
158
157
8
154
13
7
14
141
32
34
4
2
22
31
33
6
51
52
53
54
12
11
20

FIG.6

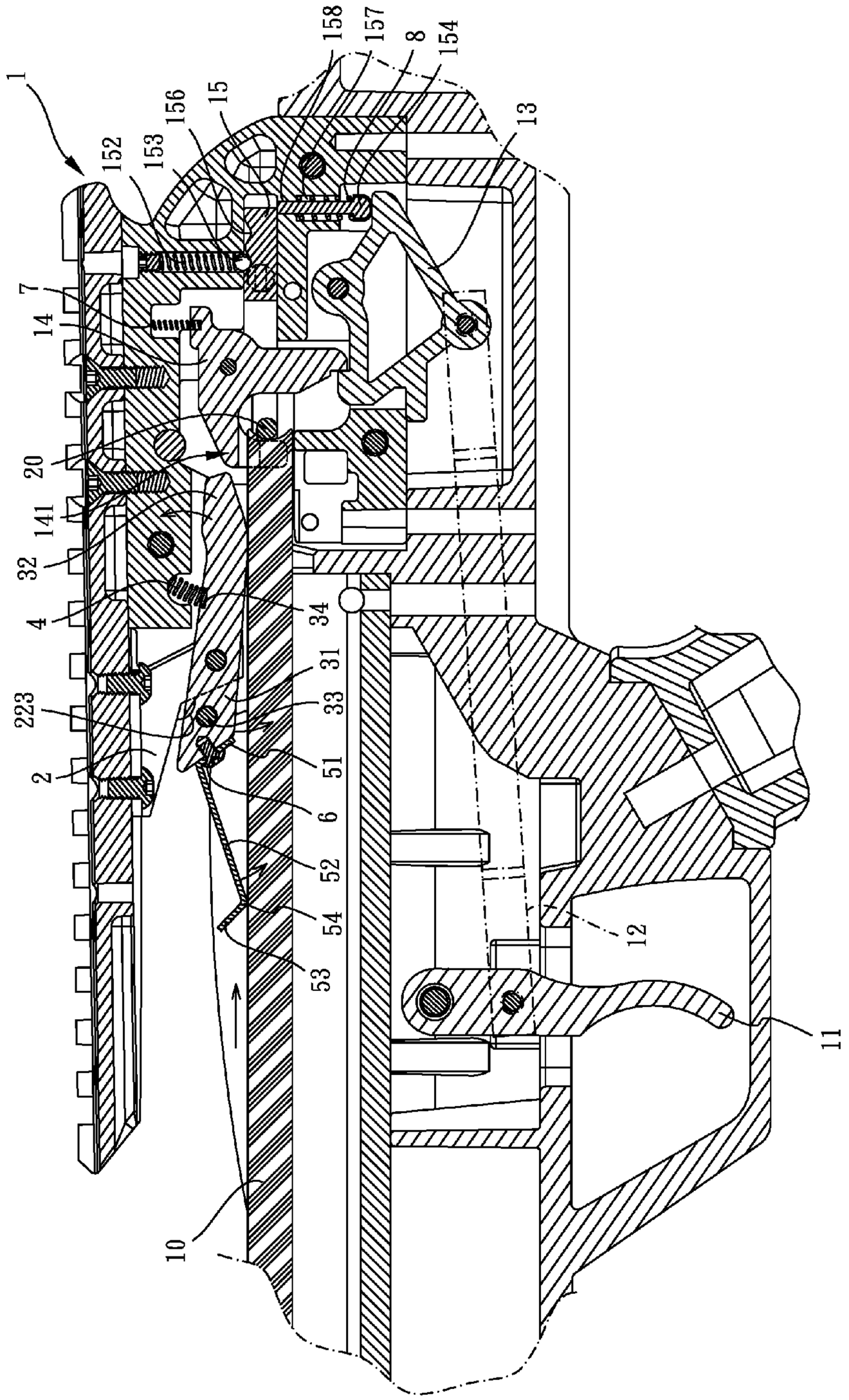

1
152
153
156
15
158
157
8
154
13
7
14
20
141
32
4
34
31
223
33
2
51
6
52
54
53
12
11
10

FIG.7

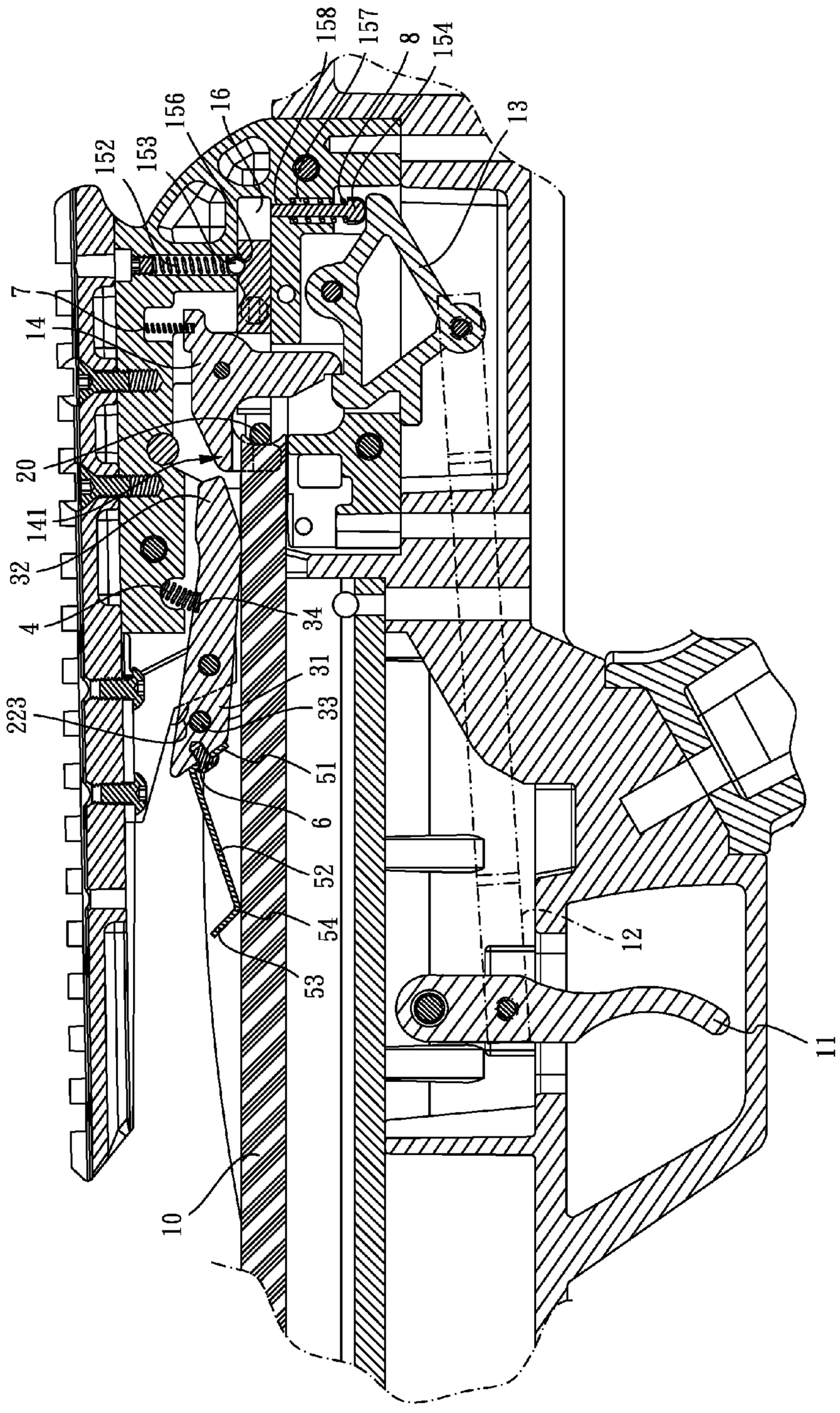

158
157
8
154
13
156
16
152
153
7
14
20
141
32
4
34
31
223
33
51
6
52
54
53
12
11
10

FIG.8

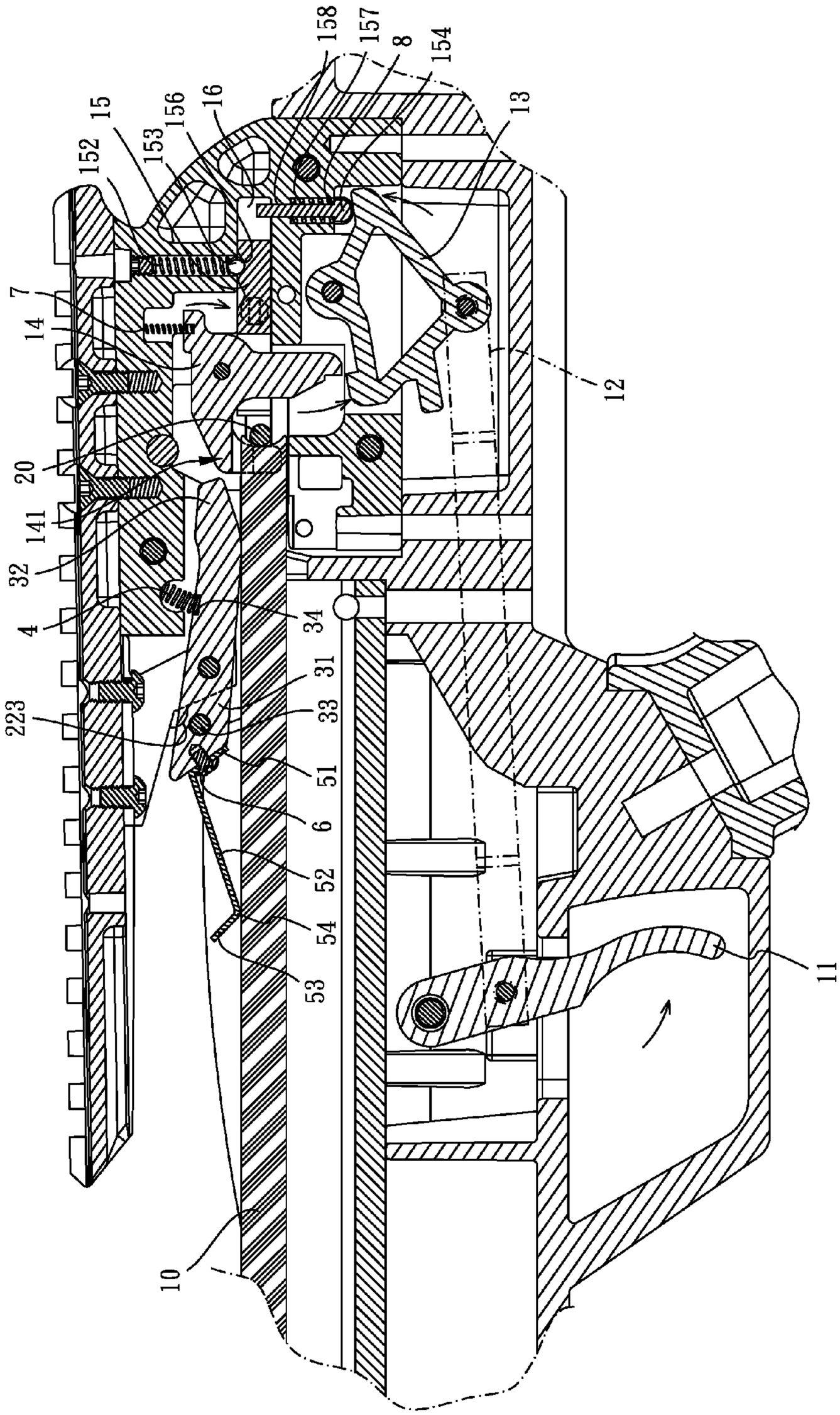

158
157
8
154
13
15
156
16
153
152
7
14
12
20
141
32
4
34
31
223
33
51
6
52
54
53
11
10

FIG.9

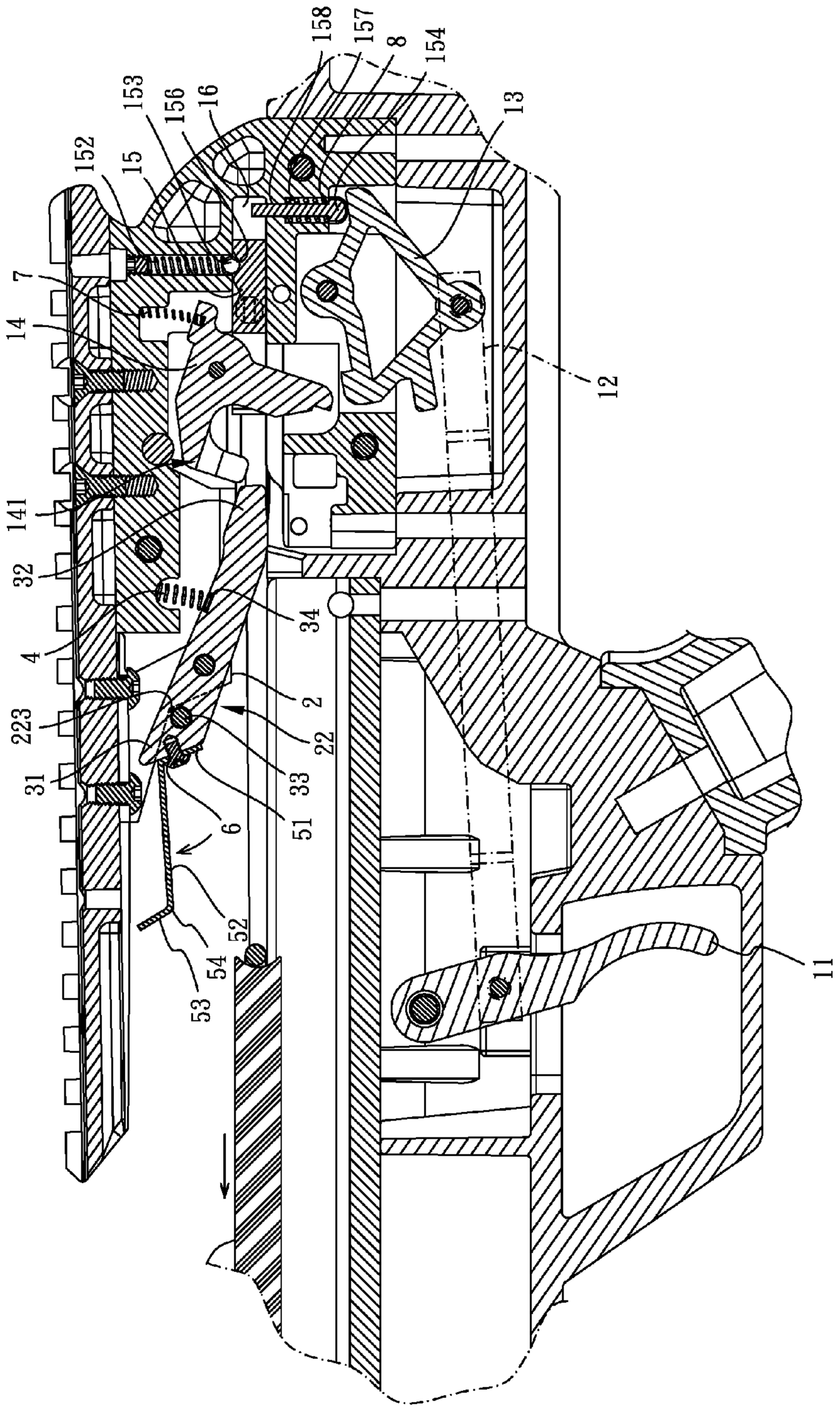

158
157
8
154
153
156
16
13
152
15
7
14
12
141
32
34
4
2
223
22
31
33
51
6
52
54
53
11

FIG.10

ARROW RETENTION DEVICE OF CROSSBOW

BACKGROUND OF THE INVENTION

1. Fields of the Invention

The present invention relates to a crossbow, and more particularly, to an arrow pressing device of a crossbow and the pressing device firmly positions the arrow before shooting.

2. Descriptions of Related Art

The conventional crossbow comprises a b, a riser, a string, a barrel, a foregrip, a trigger unit, a stock and a retention member. An arrow is first put in the flight groove and the retention member presses on the arrow to ensure that the arrow does not shift such that the arrow can be sent to the target as expected. Nevertheless, when the user pulls the trigger to shoot the arrow, the retention member still applies a downward force to the arrow. The downward force pushes the rear end of the arrow and the arrow head slightly tilt upward. Besides, the downward force from the retention member reduces the speed when the arrow leaves the crossbow. The retention member will be worn out due to friction so that the retention member gradually fails to correctly press the arrow.

The present invention intends to provide an arrow retention device to eliminate the shortcomings mentioned above.

SUMMARY OF THE INVENTION

The present invention relates to an arrow retention device of a crossbow, and the arrow retention device comprises a fixing member having one end thereof fixed to a shooting device of the crossbow, and an installation slot is defined axially in the underside of the fixing member. An arm is pivotably inserted into the installation slot and has a first end and a second end. The first end is exposed beyond the installation slot, and the second end of the arm is inserted into the shooting device. A restriction rod extends from each of two sides of the arm. A pushing spring is connected to the top of the arm and biased between the second end of the arm and the shooting device. A retention member is connected to the end face of the first end of the arm and comprises a connection portion, a shank and a guide portion. The connection portion is connected to the end face of the first end of the arm and the first end of the shank. The second end of the shank is connected to the guide portion. The connection portion and the guide portion respectively extend toward, two opposite directions. A contact portion is formed at the connection portion of the shank and the guide portion. The contact portion presses the arrow put in the flight groove of the crossbow.

When the arrow is put in the shooting device, the rear end of the arrow pivots the arm so that the first end of the am drives the retention member toward the arrow. The contact portion presses the arrow. The second end of the arm compresses the pushing spring. When the shooting device is activated to shoot the arrow, the arrow leaves from the arm, and the pushing spring releases the recovery force to pivot the arm back, and the contact portion is separated from the arrow. Therefore, the arrow does not tilt when shooting.

The present invention become more obvious from the following description when taken in connection with the accompanying drawings which show, for purposes of illustration only, a preferred embodiment in accordance with the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows that the arrow retention device of the present invention is installed to a crossbow;

FIG. **2** is a side view to show that the arrow retention device al the present invention is installed to a crossbow;

FIG. **3** is a perspective view to show the arrow retention device of the present invention and a portion of the shooting device of the crossbow;

FIG. **4** is another perspective view to show the arrow retention device of the present invention and a portion of the shooting device of the crossbow;

FIG. **5** is a partial cross sectional view to show the arrow retention device of the present invention;

FIG. **6** is an enlarged cross sectional view of the arrow retention device of the present invention and a portion of the shooting device of the crossbow;

FIG. **7** shows that an arrow is put to the crossbow, the arm is pivoted and the retention member presses the arrow;

FIG. **8** shows that the safety unit is released, and the arrow is ready to shoot;

FIG. **9** shows that the user begins to pull the trigger, and

FIG. **10** shows that the retention member is separated the arrow when the trigger is pulled.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. **1** to **10**, the arrow retention device of the present invention comprises a fixing member **2** having one end thereof fixed to a shooting device **1**. An installation slot **21** is defined axially in the underside of the fixing member **2**. An arm **3** is pivotably inserted into the installation slot **21** and includes a first end **31** and a second end **32**, wherein the first end. **31** is exposed beyond the installation slot **21**, and the second end of the arm **3** is inserted into the shooting device **1**. A restriction rod **33** extends from each of two sides of the arm **3**. A pushing spring **4** is connected to the top of the arm **3**, and biased between the second end **32** of the arm **3** and the shooting device **1**. A retention member **5** is connected to the end face of the first end **31** of the arm **3** and comprises a connection portion **51**, a shank **52** and a guide portion **53**. The connection portion **51** connected to the end face of the first end **31** of the arm **3** and the first end of the shank **52**. The second end of the shank **52** is connected to the guide portion **53**. The connection portion **51** and the guide portion **53** respectively extend toward two opposite directions. A contact portion **54** is formed at the connection portion of the shank **52** and the guide portion **53**. The contact portion **54** presses an arrow **10** in the fight groove of the crossbow.

When the arrow **10** is put in the shooting device **1**, the rear end of the arrow **10** pivots the arm **3** so that the first end **31** of the arm **3** drives the retention member **5** toward the arrow **10**. The contact portion **54** presses the arrow **10**, and the second end **32** of the arm **3** compresses the pushing spring **4**. This ensures that the arrow **10** does not shift before pulling the trigger **11**.

When the shooting device **1** is activated to shoot the arrow **10** by pulling the trigger **11**, the arrow **10** leaves from the arm **3** and the pushing spring **4** releases a recovery force, so that the second end **32** of the arm **3** is pivoted back (downward), and the first end **31** of the arm **3** and the contact

portion **54** are separated from the arrow **10**. By this specific arrangement of the present invention, the arrowhead of the arrow **10** does not tilt upward when the string sends the arrow **10** toward the target as shown in FIGS. **6** to **10**.

The fixing member **2** includes two notches **22** which are located corresponding to the restriction rods **33**. Each notch **22** includes a first inclined face **221** and a second inclined face **222**, and an angled area **223** is formed between the first and second inclined faces **221**, **222**. The angle of the angled area. **223** is larger than 90 degrees or equal to 90 degrees. The restriction rods **33** are engaged with the angled area **223** when the arm **3** is not pivoted, and the restriction rods **33** are move away from the angled area **223** when the arm **3** is pivoted. When the angle is larger than 90 degrees, the time that the restriction rods **33** contact the angled area **223** is faster than that when the angle is equal to 90 degrees. The users can use the feature to adjust the crossbow according to individual needs. As shown in FIGS. **9** and **10**, the setting to the angle relates the time required to install an arrow **10** to the crossbow. Besides, in order to prevent the pushing spring **4** from disengaged from its position by the pressure from the second end **32** of the arm **3**, the arm **3** includes a recess **34** which is located corresponding to the pushing spring **4**, and one end of the pushing spring **4** is securely engaged with the recess **34**. Therefore, the pushing spring **4** does not disengaged from the recess **34** when the second end **32** compresses the pushing spring **4**. The pushing spring **4** can provide a stable recovery force to the arm **3**. The recovery force from the pushing spring **4** relates the time that the arm **3** pivots back, so that the users may use the angle setting of the angled area **223** and the pushing spring **4** to install the arrow **10** to the crossbow quickly. The force of the pushing spring **4** affects the speed that the arm **3** pivots back as shown in FIG. **6**.

As shown in FIG. **3**, a bolt **6** extends through the connection portion **51** of the retention member **5** and is connected to the first end **31** of the arm **3**. The retention member Scan also be connected to the arm **3** by other known methods such as adhering, magnetic attracting, or snapping.

The shooting device **1** comprises a trigger **11**, a link **12**, a driving member **13** and a striking member **14**. The trigger **11** is exposed beyond the body of the crossbow, and the link **12** and the driving member **13** are installed in the body of the crossbow. The link **12** is connected between the trigger **11** and the driving member **13**. The striking member **14** is located in the shooting device **1** and hooked to the driving member **13**. The striking member **14** is located beside the arm **3** and has a hook **141** which is used to hook the string **20** of the crossbow. As shown in FIGS. **9** and **10**, when the trigger **11** is pulled, the link **12** is driven to pivot the driving member **13**. The driving member **13** is pivoted to separate striking member **14** from the driving member **13**. A resilient member **7** is located on the top of the striking member **14**. The resilient member **7** is biased between the striking member **14** and the shooting device **1**. The resilient member **7** pivots the striking member **14** to release the string **20** to shoot the arrow **10**. The string **20** and the arrow **10** are located on a common horizontal plane.

The shooting device **1** includes a safety unit **15** which is located beside the driving member **13** and the striking member **14**. The safety unit **15** includes a safety pin **151**, a positioning spring **152**, a ball **153** and a restriction pin **154**. A control rod **155** extends from each of two sides of the safety pin **151** and is exposed beyond the shooting device **1**. The shooting device **1** has a path **16** in which the safety pins **151** are slidably received. An oval opening **161** is defined in each of two sides of the path **16**. The control rods **155** slidably extend through the oval openings **161**. The safety pins **151** each have two first slots **156** defined in the top thereof. The positioning spring **152** and the ball **153** are secured to the shooting device **1**. The ball **153** is engaged with one of the two first slots **156**, the positioning spring **152** is biased between the shooting device **1** and the ball **153**. The restriction pin **154** has a second slot **157** and a passage **158**. The passage **158** communicates with the second slot **157** and the path **16**. A spring **8** is received in the second slot **157**. The restriction pin **154** has a first end thereof biasing the driving emmer **13**, and a second end of the restriction pin **154** extends through the second slot **157**, the spring **8** and the passage **158**. The safety pin **151** slides in the path **16** and presses the restriction pin **154** to restrict and secure the driving member **13** under the safety mode as shown in FIG. **6**. The safety pin **151** slides in the path **16** and away from the restriction pin **154**, and the driving member **13** is pivoted to push the restriction pin **154** which extends through the passage **158** and reaches into the path **16** under a shooting mode as shown in FIG. **9**.

The cooperation of the arm **3** and the retention member **5** ensures that the arrow **10** does not shift. The speed of the arrow **10** that leaves from the crossbow is not reduced. The arm **3** brings the retention member **5** does not generate noise. The users can quickly shoot arrows **10** consecutively because the arm **3** is quickly pivoted after the previous arrow **10** leaves from the crossbow.

While we have shown and described the embodiment in accordance with the present invention, it should be clear to those skilled in the art that further embodiments may be made without departing from the scope of the present invention.

What is claimed is:

1. An arrow retention device of a crossbow, comprising:

a fixing member (**2**) having one end thereof fixed to a shooting device (**1**), an installation slot (**21**) defined axially in an underside of the fixing member (**2**);

an arm (**3**) pivotably inserted into the installation slot (**21**) and having a first end (**31**) and a second end (**32**), the first end (**31**) being exposed beyond the installation slot (**21**), the second end of the arm (**3**) inserted into the shooting device (**1**), a restriction rod (**33**) extending from each of two sides of the arm (**3**), a pushing spring (**4**) connected to a top of the arm (**3**), the pushing spring (**4**) biased between the second end (**32**) of the arm (**3**) and the shooting device (**1**);

a retention member (**5**) connected to an end face of the first end (**31**) of the arm (**3**) and comprising a connection portion (**51**), a shank (**52**) and a guide portion (**53**), the connection portion (**51**) connected to the end face of the first end (**31**) of the arm (**3**) and a first end of the shank (**52**), a second end of the shank (**52**) connected to the guide portion (**53**), the connection portion (**51**) and the guide portion (**53**) respectively extending toward two opposite directions, a contact portion (**54**) formed at a connection portion of the shank (**52**) and the guide portion (**53**), the contact portion (**54**) adapted to press an arrow (**10**);

when the arrow (**10**) is put in the shooting device (**1**), a rear end of the arrow (**10**) pivots the arm (**3**) so that the first end (**31**) of the arm (**3**) drives the retention member (**5**) toward the arrow (**10**), the contact portion (**54**) presses the arrow (**10**), the second end (**32**) of the arm (**3**) compresses the pushing spring (**4**), when the shooting device (**1**) is activated to shoot the arrow (**10**), the arrow (**10**) leaves from the arm (**3**) and the pushing

spring (**4**) releases a recovery force and the arm (**3**) is pivoted back, and the contact portion (**54**) is separated from the arrow (**10**).

2. The arrow retention device of a crossbow as claimed in claim **1**, wherein the fixing member (**2**) includes two notches (**22**) which are located corresponding to the restriction rods (**33**), each notch (**22**) includes a first inclined face (**221**) and a second inclined face (**222**), an angled area (**223**) is formed between the first and second inclined faces (**221**, **222**), an angle of the angled area (**223**) is larger than 90 degrees or equal to 90 degrees, the restriction rods (**33**) are engaged with the angled area (**223**) when the arm (**3**) is not pivoted, the restriction rods (**33**) are move away from the angled area (**223**) when the arm (**3**) is pivoted.

3. The arrow retention device of a crossbow as claimed in claim **2**, wherein the arm (**3**) includes a recess (**34**) which is located corresponding to the pushing spring (**4**), one end of the pushing spring (**4**) is securely engaged with the recess (**34**).

4. The arrow retention device of a crossbow as claimed in claim **1**, wherein the arm (**3**) includes a recess (**34**) which is located corresponding to the pushing spring (**4**), one end of the pushing spring (**4**) is securely engaged with the recess (**34**).

5. The arrow retention device of a crossbow as claimed in claim **1**, wherein a bolt (**6**) extends through the connection portion (**51**) of the retention member (**5**) and is connected to the first end (**31**) of the arm (**3**).

6. The arrow retention device of a crossbow as claimed in claim **5**, wherein the shooting device (**1**) comprises a trigger (**11**), a link (**12**), a driving member (**13**) and a striking member (**14**), the trigger (**11**) is adapted to be exposed beyond a body of the crossbow, the link (**12**) and the driving member (**13**) are adapted to be installed in the body of the crossbow, the link (**12**) is connected between the trigger (**11**) and the driving member (**13**), the striking member (**14**) is located in the shooting device (**1**) and hooked to the driving member (**13**), the striking member (**14**) is located beside the arm (**3**) and has a hook (**141**) which is adapted to hook a string (**20**), when the trigger (**11**) is pulled, the link (**12**) is driven to pivot the driving member (**13**), the driving member (**13**) is pivoted to separate striking member (**14**) from the driving member (**13**), a resilient member (**7**) is located on a top of the striking member (**14**), the resilient member (**7**) is biased between the striking member (**14**) and the shooting device (**1**), the resilient member (**7**) pivots the striking member (**14**) to release the string (**20**), the string (**20**) and the arrow (**10**) are located on a common horizontal plane.

7. The arrow retention device of a crossbow as claimed in claim **6**, wherein the shooting device (**1**) includes a safety unit (**15**) which is located beside the driving member (**13**) and the striking member (**14**), the safety unit (**15**) includes a safety pin (**151**), a positioning spring (**152**), a ball (**153**) and a restriction pin (**154**), a control rod (**155**) extends from each of two sides of the safety pin (**151**) and is exposed beyond the shooting device (**1**), the shooting device (**1**) has a path (**16**) in which the safety pins (**151**) are slidably received, an oval opening (**161**) is defined in each of two sides of the path (**16**), the control rods (**155**) slidably extend through the oval openings (**161**), the safety pins (**151**) each have two first slots (**156**) defined in a top thereof, the positioning spring (**152**) and the hall (**153**) are secured to the shooting device (**1**), the ball (**153**) is engaged with one of the two first slots (**156**), the positioning spring (**152**) is biased between the shooting device (**1**) and the ball (**153**), the restriction pin (**154**) has a second slot (**157**) and a passage (**158**), the passage (**158**) communicates with the second slot (**157**) and the path (**16**), a spring (**8**) is received in the second slot (**157**), the restriction pin (**154**) has a first end thereof biasing the driving member (**13**), a second end of the restriction pin (**154**) extends through the second slot (**157**), the spring (**8**) and the passage (**158**), the safety pin (**151**) slides in the path (**16**) and presses the restriction pin (**154**) to restrict and secure the driving member (**13**) under a safety mode, the safety pin (**151**) slides in the path (**16**) and away from the restriction pin (**154**), and the driving member (**13**) is pivoted to push the restriction pin (**154**) which extends through the passage (**158**) and reaches into the path (**16**) under a shooting mode.

* * * * *